Tracking Patient Encounters Using an Enterprise Membership Index System

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INTRODUCTION

We have developed an Enterprise Membership Index (EMI) System for tracking patients in a networked health care delivery environment. While EMI in a traditional sense is used for cross referencing patient identifiers, our design allows the system to also capture patient visits and maintain visit summary information. This is accomplished by means of electronic interfaces with other patient registration systems, and by direct user interface to EMI's registration function. The information it stores constitutes a longitudinal patient record across the enterprise and the continuum of care. When EMI is used with clinical data repositories, the visit information can directly point to visit details in these repositories. Such ability to link patient and visit data at a global level provides invaluable information for improving patient care and reducing cost.

SYSTEM OVERVIEW

EMI is a client-server system developed using object-oriented technology. Its three-tier architecture consists of (1) a physical database running on a high performance UNIX server; (2) an object layer handling data access, security and business rules; and (3) a set of applications built on top of the object layer. The EMI database is primarily accessed through two applications: an electronic interface using Health Level Seven (HL7) protocol and a user interface application. The former allows ancillary systems, such as hospitals' ADT systems to communicate with EMI. The latter allows direct user entry of patient and visit data into EMI.

A typical operating environment for EMI is a network linking multiple hospitals, clinics and doctors' practices in a health care enterprise. As patient visits are registered by systems at each care facility, visit information is communicated to EMI through its electronic or user interfaces. The data EMI captures include patient demographics, insurance information, care providers, and visit summaries.

In the current implementation, Sybase is used as database server. The HL7 interface runs on a Microsoft NT server. The user interface runs on Windows NT or Windows 95 PCs.

PATIENT MATCHING

A crucial element in this system is a utility to find the patient by user-defined criteria and properly associate information received from different systems for the patient. It is well known that uniquely identifying a person's record is non-trivial, especially at the enterprise level where patient identities may change from location to location. Our solution is two-fold: a sophisticated rule-based patient matching technique and a procedure for possible user intervention. The follow steps are involved:

Selecting Search Criteria. The user can choose search parameters out of 12 categories in EMI data and assign a confidence level or relative weight to each parameter. The degree of match is represented by a score between 0 and 100. A score of 100 indicates an exact match while a score below 100 indicates a partial match.

Filtering and Scoring. First, record filtering is done on the database server through carefully constructed SQL queries. Second, the filtered record set is scored by the object layer. The score of match for a record is defined as a weighted average of scores of individual search parameters. Finally, the search results (a set of potential match records) are sorted in descending order of their overall matching scores.

Decision Making. Patient matching in HL7 interface is performed when a visit transaction arrives. Three outcomes are expected when matching the received data with patient records: found a match, found no matches, or found potential matches. The user can set score ranges for each of these outcomes. If a match is found, EMI updates the patient record with the new visit information. If no match is found, EMI creates a new patient record and stores visit information with the new record. If potential matches exist, EMI creates a temporary patient record and stores the visit data with the temporary record. The temporary record must be manually resolved by an operator.

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